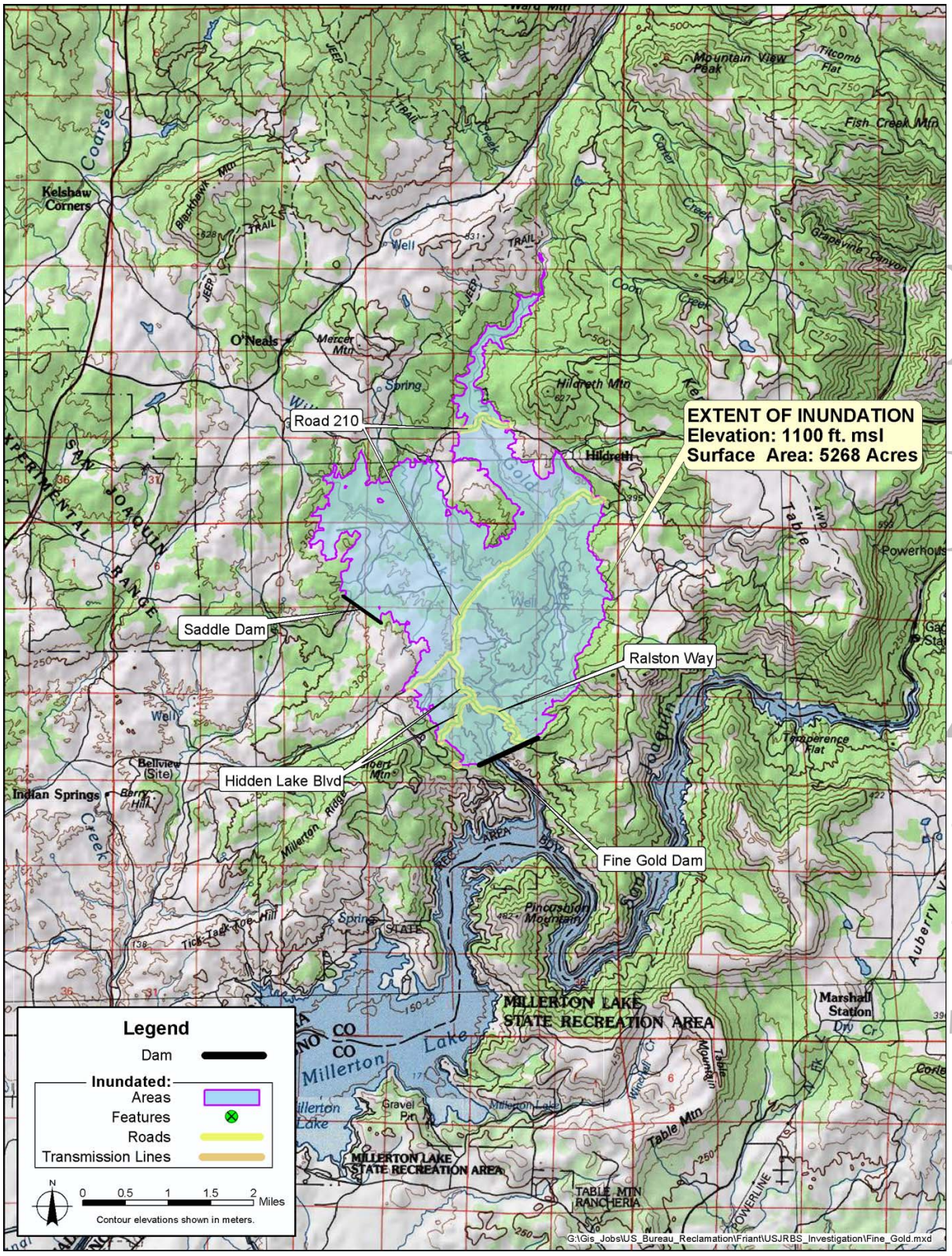

FIGURE 5-6. FINE GOLD CREEK RESERVOIR OPTION

San Joaquin River Watershed - Temperance Flat Reservoir

Description of Options

Temperance Flat is a wide, bowl-shaped area in the upper portion of Millerton Lake upstream of the confluence with Fine Gold Creek (Figure 5-7). Three dam sites with similar geologic conditions were considered that would result in the inundation of the Temperance Flat area; at River Mile (RM) 274, at River RM 279, and at RM 280. At each site, two dam sizes were considered, at crest elevations of 900 feet elevation (MSL) and 1100 feet. Two dam types were considered for each site - a roller-compacted concrete gravity structure and a concrete-face rockfill dam - each suitable for either the smaller or larger dam size.

Temperance Flat Reservoir would capture the flow of the San Joaquin River before it enters Millerton Lake. The operation of Temperance Flat Reservoir would be integrated with storage in Millerton Lake. Water would be released from Temperance Flat to Millerton Lake and diverted to the Friant-Kern Canal, the Madera Canal, and/or released to the San Joaquin River.

Engineering and Environmental Findings

Geologic conditions are favorable for dam construction at the sites considered and borrow sources for material could be obtained within the reservoir inundation area. Table 5-1 compares construction-related characteristics of the three potential dam site locations. As indicated, the depth of water in Millerton Lake at this location exceeds 200 feet, which would require larger cofferdams than the other sites considered, and access would be through a residential area. For these reasons, the RM 280 site was dropped from further consideration.

The RM 279 site and the RM 280 sites could both be accessed through the same route, which could be developed without creating impacts to the local community. Both sites would use the same general construction lay-down and staging areas within the reservoir pool. The RM 280 site would require the smallest size cofferdams of the three sites. However, the required length of the permanent dam crest would be greatest and it would result in the least potential storage volume. In consideration of these factors, the RM 280 site was dropped and the RM 279 site was retained for further consideration.

TABLE 5-1
TEMPERANCE FLAT DAM SITE OPTIONS

Item	RM 274	RM 279	RM 280
Volume (TAF)	**2,110**	**1,235**	**1,044**
Area (acres)	**8,200**	**5,500**	**4,800**
Water depth (ft)	**210**	**120**	**90**
Dam crest length (ft)	**3,200**	**3,500**	**4,000**
Access	**Residential**	**No Concern**	**No Concern**
Note: All estimates based on 1,100 feet MSL dam crest elevation.			

Maintaining Millerton Lake operations during construction would require diversion tunnels through both abutments of the new dam. The diversion tunnels would be 30 and 40 feet in diameter. A new reservoir at Temperance Flat would inundate existing hydroelectric generation facilities but would also create an energy production opportunity. The smaller dam option (inundation to 900 feet elevation) would inundate Kerckhoff Powerhouses 1 and 2. The larger dam option (inundation to 1,100 feet elevation) would also inundate Kerckhoff Dam and Reservoir and Wishon Powerhouse.

Either reservoir option at RM 279 would inundate much of the Millerton Lake State Recreation Area as well as the Squaw Leap Management Area, which is managed by the U.S. Bureau of Land Management. The larger reservoir option would also inundate Sierra National Forest lands above Kerckhoff Dam. The Patterson Bend whitewater boating run, below Kerckhoff Dam, would be partially inundated by a new Temperance Flat reservoir. It is considered a Class V rapid. A portion of the Horshoe Bend run, above Kerckhoff Reservoir would be inundated by the larger reservoir option. In addition, the larger reservoir option would inundate recreational facilities at Kerckhoff Reservoir.

In general, habitat types that would be affected by creation of Temperance Flat Reservoir are similar to those at Millerton Lake and Fine Gold Creek. The region is dominated by foothill woodlands of pine and blue oak, with open perennial grasslands. A considerable amount of such habitat would be inundated by a reservoir. Sixteen wildlife species of special concern are documented as occurring in the project area and could be affected by a new Temperance Flat reservoir.

Both American shad (Alosa sappdissima) and striped bass (Morone saxatilits) spawn in the reach of the San Joaquin River between Millerton Lake and Kerckhoff Dam. The American shad, an anadromous Atlantic Ocean species successfully introduced to Sacramento and San Joaquin rivers, was planted in Millerton Lake accidentally in the mid 1950s and is now the only known existing landlocked population of the species. Stocking of striped bass was suspended in 1987, but some natural reproduction occurs. The smaller Temperance Flat reservoir would likely result in adversely effects to spawning of both fish populations, and the larger reservoir would completely inundate that stretch of the river.

Prehistoric archaeological sites exist within the potentially inundated area, as do sites where mining occurred historically. Past mining sites would need to be assessed not only for their potential historic significance but also for their potential to affect water quality.

From a geologic and engineering perspective, the RM 279 site appears suitable for development of a storage facility. Further evaluation will is needed to more fully identify the extent of environmental impacts and mitigation requirements. This option will be retained for further consideration

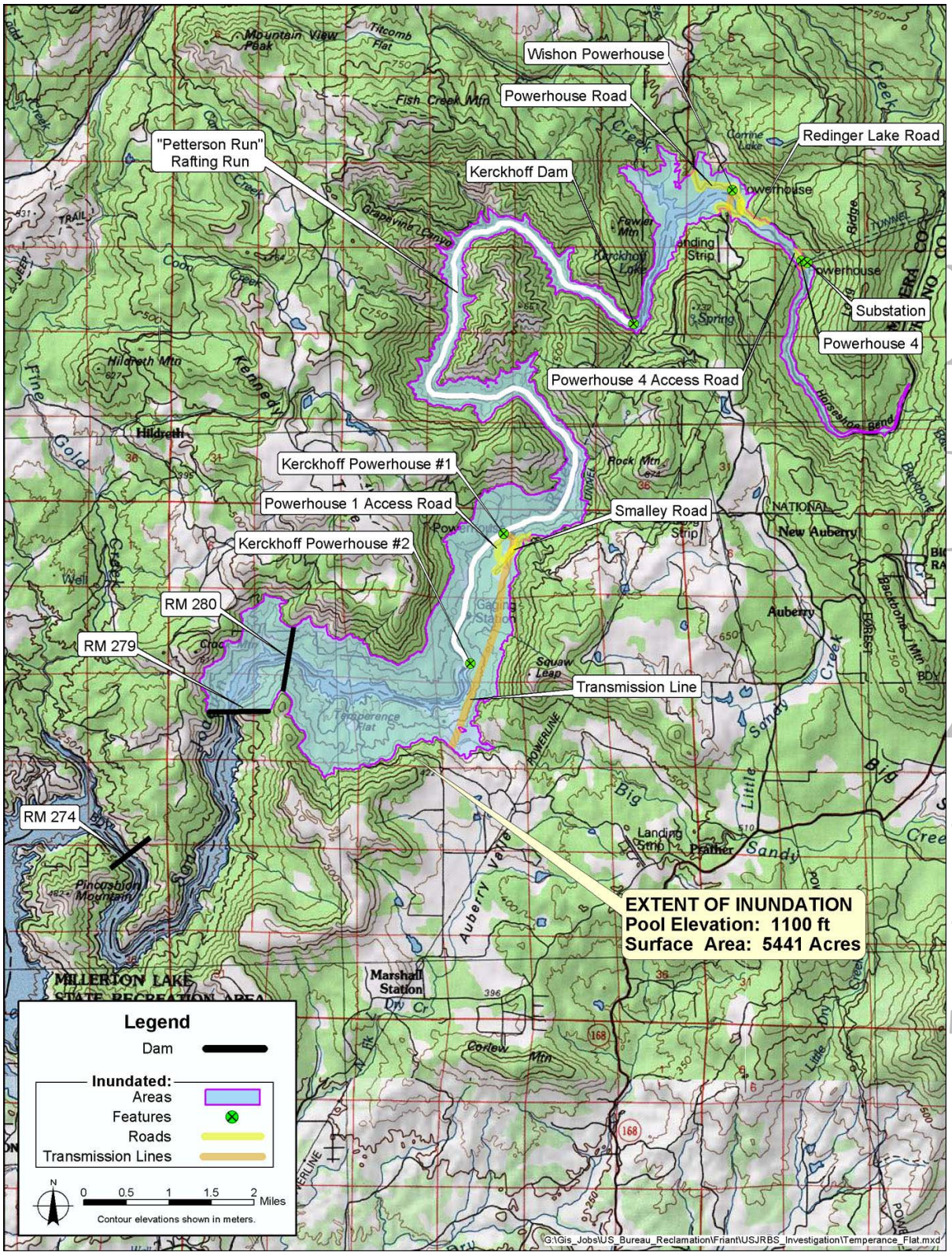

FIGURE 5-7. TEMPERANCE FLAT RESERVOIR OPTION

San Joaquin River Watershed - Kerckhoff Lake Enlargement

Description of Options

Kerckhoff Dam and Lake are components of the Pacific Gas and Electric (PG&E) Kerchkoff Project, which is located on the San Joaquin River, upstream of Millerton Lake, below the confluence of Willow CreekKerchkoff Lake, and serves as a afterbay to the Wishon Powerhouse and a forebay for diversion to Kerchkoff Powerhouses #1 and #2. Enlargement of Kerckhoff Lake would involve the construction of a new dam at a location downstream of Kerchkoff Dam. During the evaluation of Temperance Flat sites, the engineering and geology team identified a potential dam site at approximately River Mile 286 (RM 286) on the San Joaquin River, between Temperance Flat and the existing Kerckhoff Dam (Figure 5-8). The additional storage spacewould capture San Joaquin River flows and would be operated in coordination with Millerton Lake.

Engineering and Environmental Findings

As stated above, the potential dam site at RM 286 was identified after field studies for this Investigation had already been completed, thus, the engineering and environmental analysis for this option is less detailed than for other options. Potential dam sizes could range from 180 feet high, which would result in a dam crest elevation of 900 feet (MSL) and a capacity of 14,000 acre-feet, to a 680-foot high structure with crest elevation 1,400 feet and capacity of 2 million acre-feet.

The RM 286 site is narrower and steeper than the Temperance Flat sites considered further downstream, and would require smaller structures at potentially lower cost. The site is located above the upper limit of Millerton Lake and would not require cofferdams as large as those for downstream sites. It is possible that the existing Kerckhoff Dam and penstock could be incorporated in the design of the upstream cofferdam and diversion facilities. Impoundments at this site to el. 1,100 would inundate the same upstream areas as the larger Temperance Flat storage option (640 feet high dam at RM 279). Existing infrastructure that would be affected include Kerckhoff Dam and Reservoir, power plants, a bridge, and facilities around the Kerchkoff Lake shoreline. Environmental impacts would be similar to those described for Temperance Flat, although the portion of the San Joaquin River below the dam site would not be affected.

Impoundment up to el. 1,400 would inundate Redinger Dam and Lake and the entire Horshoe Bend whitewater run. Impoundment above el. 1,400 would impact the Chanwanakee community, which is on the southern shore of Redinger Lake.

The RM 286 site is similar to the RM 279 site and does not appear to present engineering or environmental concerns at this time that would preclude project development. This option will be retained for further consideration.

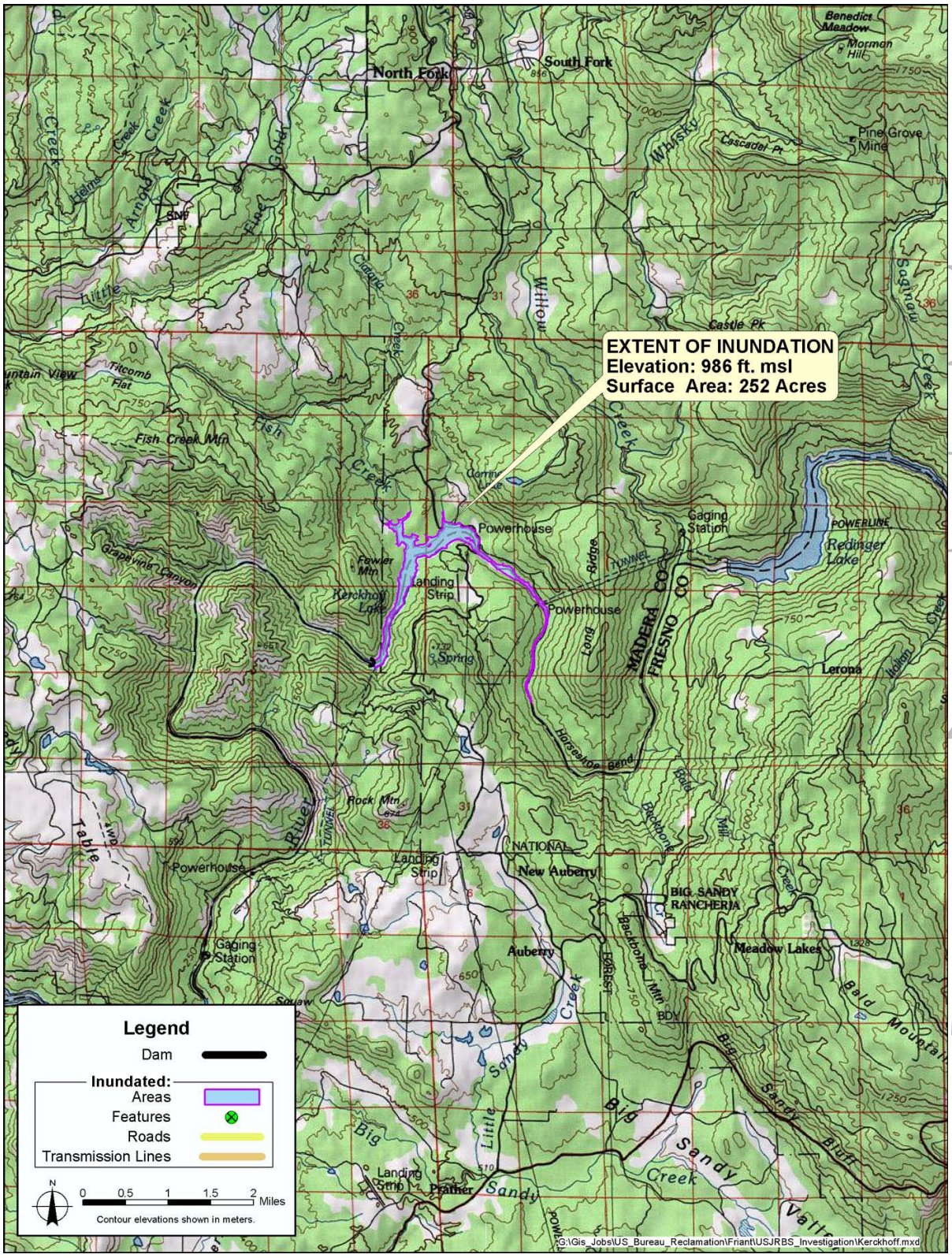

FIGURE 5-8. KERCKHOFF LAKE ENLARGEMENT OPTION

San Joaquin River Watershed - Mammoth Pool Reservoir Enlargement

Description of Options

Mammoth Pool Reservoir is owned and operated by Southern California Edison (SCE) as part of the Big Creek Project. Mammoth Pool Dam and Reservoir are located in the upper San Joaquin River watershed at the confluence of Chiquito Creek and the San Joaquin River, upstream of Kerckhoff Lake (Figure 5-9). The existing spillway is ungated.

In 1982 SCE completed a conceptual study on adding gates to the spillway to increase power generation. Storage volume could be expanded by about 30,000 acre-feet by installing 5 twenty-five-foot high radial gates on the spillway to raise the normal operating pool and increase active storage. To maintain dam freeboard, a 5-foot parapet wall would extend above the existing dam crest. This would increase the totoal capacity of Mammoth Pool by about 30 percent.

The enlarged reservoir would continue to capture San Joaquin River flows. Water could be released from an enlarged Mammoth Pool to the San Joaquin River and re-captured in Millerton Lake. Additional storage in Mammoth Pool would provide an opportunity to increase available flood storage space on the San Joaquin River. In addition, by increasing the water surface elevation the energy head would be increased, which would lead to increased hydroelectric energy production.

Engineering and Environmental Findings

The FWUA, in coordination with SCE, is currently re-evaluating an enlargement Mammoth Pool for water supply and power generation purposes. The modifications would be similar to those described above. On the basis of the previous study, no major engineering issues are expected that would physically prevent construction of gates over the spillway.

Institutional issues would need to be addressed to move the proposal forward. SCE, as owner of Mammoth Pool, would need to support the enlargement. In addition, the project would require a permit from the California Department of Water Resources' (DWR) Division of Safety of Dams (DSOD), which is reported to have a preference for ungated spillways. One approach to address this concern would be keeping the gates open during the rainflood season. Mammoth Pool Dam and Reservoir is also licensed and regulated by the Federal Energy Regulatory Commission, Office of Energy Projects.

Expansion of the reservoir would cause the inundation of mixed Sierran forest habitat, which is dominated by conifers but also contains hardwood species such as oak. Some riparian and wetland habitat would also be lost, which would probably require mitigation. Environmental impacts are expected to be relatively low and mitigable. This option will be retained for further consideration.

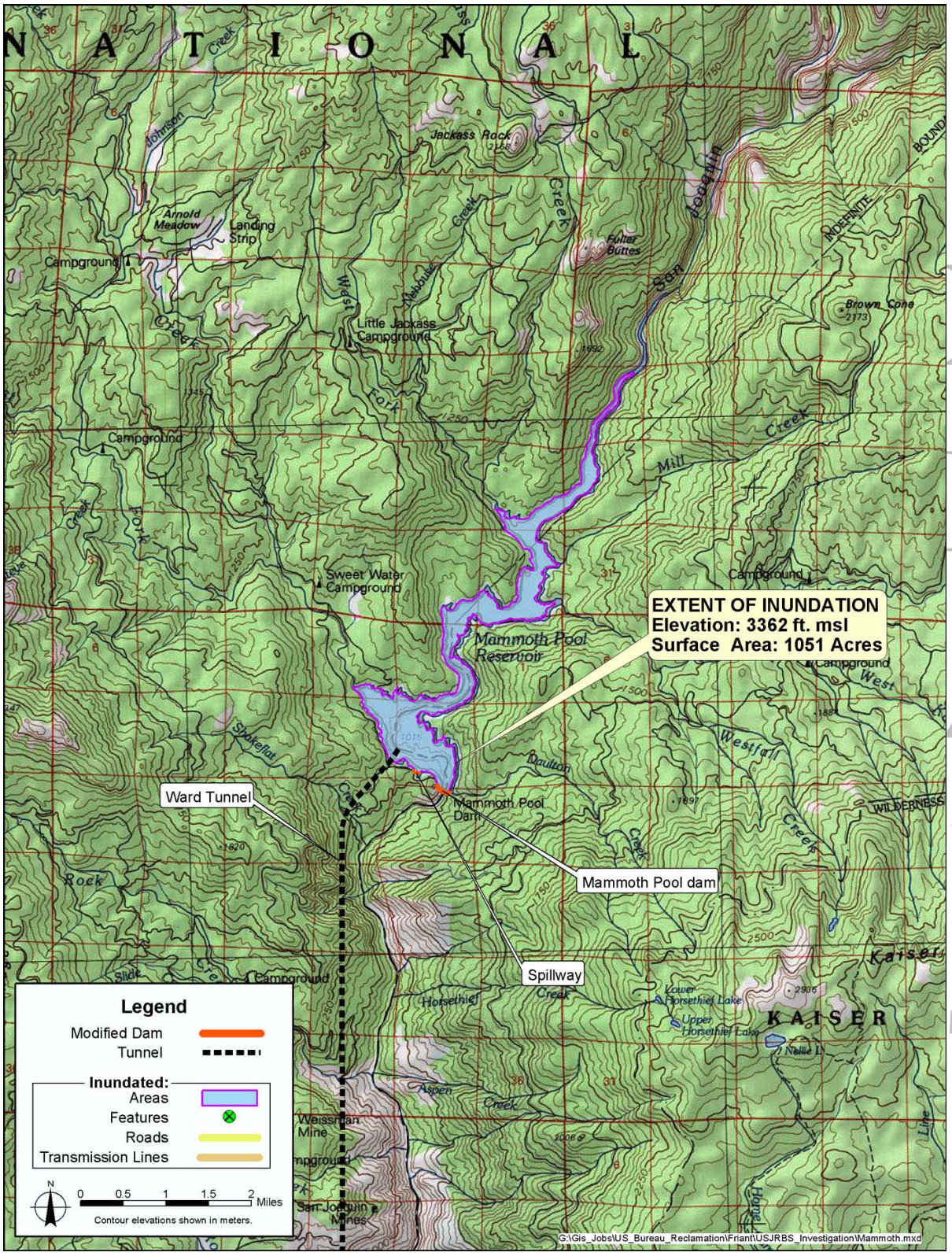

FIGURE 5-9. MAMMOTH POOL ENLARGEMENT OPTION

San Joaquin River Dry Creek Watershed - Big Dry Creek Dam and Reservoir

Description of Option

Big Dry Creek Dam and Reservoir is an existing flood control structure in Fresno County, near Clovis, operated by the Fresno Metropolitan Flood Control District (FMFCD) (Figure 5-10). The reservoir spans Dry Creek and associated smaller drainages to the north of Big Dry Creek. A zoned earthfill embankment, the dam creates a reservoir with a storage capacity of approximately 30,000 acre-feet. However, due to seepage concerns and lack of inflows, the total storage capacity has not been exploited.

Utilization of the full 30,000 acre-feet storage capacity at a minimum would require construction of a turnout from the nearby Friant-Kern Canal, northeast of the reservoir. The proposed turnout would be built at the point where the canal siphon passes under Big Dry Creek. In addition, construction of an energy dissipation structure would reduce velocities of the new flows conveyed into the reservoir.

Under this proposal, the new conveyance would enable the Big Dry Creek Reservoir to be operated as an off-stream storage facility for water diverted from the Friant-Kern Canal. The stored water would be used to supplement or offset the delivery to service areas along the Friant-Kern Canal. Due to the flood control obligation of the reservoir, no carryover storage would be allowed into the wet season.

Engineering and Environmental Findings

Dam safety concerns related to seepage make the viability of this option uncertain. The DWR Division of Safety of Dams (DSOD) has indicated that no more than 10,000 acre-feet can be stored in the existing reservoir, and only if the dam demonstrates satisfactory performance when the reservoir is filled to 25 percent of the dam height and again at the 50 percent level. The duration of storage is also restricted to at most 90 days, from April through September. The 25 percent level test was accomplished without significant seepage problems. The District is has not had adequate water to test the 50 percent requirement. Modification of the dam for water storage longer than 90 days may require extensive reconstruction of the dam.

Few environmental impacts would be expected from storing up to 30,000 acre-feet over periods longer than 90 days. Although some riparian habitat may be adversely affected, this option presents an opportunity to increase the total amount of riparian habitat. Vernal pools and some species of concern that are known to exist in the area but not known to occupy the specific site that would be inundated.

This option will be dropped from further consideration because of uncertainty regarding the ability to convert this facility for long-term storage capacity, and the relatively small storage amount. However, the site may be suitable for integration with groundwater recharge facility operations. The existing facility can divert up to 700 cfs of detained floodwater to the San Joaquin River through the Little Dry Creek Flood Channel. Releases up to 150 cfs can also be made to Big Dry Creek and distributed to downstream detention basins in the FMFCD system to assist in recharging the regional groundwater basin.